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Carlyle); the establishment of graduates' courses and arrangements made to facilitate the prosecution of research work, so as to take advantage of the splendid equipment for that end now possessed by the University. This consists of laboratories of mathematics and dynamics, fully provided with instruments of measurement, gravity balances, machines for experimenting on the laws of motion, etc.; three chemical laboratories for qualitative and quantitative work and for original investigation, and supplied with Becker & Son (4) and Bunge (1) balances; a Trøemner bullion-balance; a Laurent polariscope, Dubosq spectroscope, etc.; the McDonald physical laboratory of five stories, each 8000 square feet area, including elementary and special laboratories for heat and electricity; rooms for optical work and photography; two large laboratories arranged for research, with solid piers and the usual standard instruments, etc.; the electric laboratory, with Kelvin electric balances, a Thomson galvanometer, two dynamo-meters (Siemens), voltmeters, ammeters, etc.; the magnetic laboratory, the dynamo room, the lighting station, the accumulator room, geodetic, hydraulic testing, thermo-dynamic and mechanical laboratories. The McDonald Engineering Building and its equipment were the gift of the same generous friend of scientific education whom McGill University has just thanked for its botanic garden. Mr. McDonald also contributed liberally towards the erection of the workshops built on the endowment of the late Thomas Workman, merchant, of Montreal. These consist of machine shop, foundry, smith shop and carpenter, wood-turning and pattern-making departments, and are intended, under the direction of the professor of mechanical engineering, to familiarize the student with the materials and implements of construction.

Although Prof. Milne (whose recent loss every friend of science deplores) and other

seismologists are wont to class the earth movements of the United States and Canada under a common head, Canada has had a fair proportion of such disturbances all to herself. Every student of Canada's annals has had his attention drawn to the series of earthquakes which caused such consternation in the year 1663, and its extraordinary moral effects. On the 17th ult. a shock varying from severe to slight or barely perceptible was felt on both sides of the St. Lawrence, though mainly on the south side in what are called the Eastern Townships. Nearly two years ago a somewhat similar shock was felt, and nearly at the same hour, between eleven and noon. This earthquake was distinctly felt in Montreal. The most formidable visitation of the kind in recent times occurred twenty-five years ago. It cleared even the court rooms and filled the streets with frightened groups.

The Royal Society of Canada met at Ottawa on the 15th inst. A programme of considerable scientific interest was gone through.

The death of Mr. Walter H. Smith, well known in Montreal for more than twenty years as an astronomer and publisher of Smith's Planetary Almanac, is sincerely regretted by all who knew him. He was for many years connected with the *Montreal Witness*, in which paper his contributions on astronomical subjects were always read with interest, and were widely reproduced. He died on the 3d inst., in his forty-third year. He was a native of Wiltshire, England, but had lived more than half his life in Canada.

J. T. C.

CARL LUDWIG.

WITHIN a few months Germany and the world have lost three great men, Helmholtz, Freytag and Ludwig. Of these three Carl Ludwig, the physiologist, and the intimate friend of the other two, died in Leipzig on April 27th, 1895, at the age of

seventy-eight, after a life rich in scientific achievement.

The world at large can never realize the great debt that the world of science, and through it the world at large, owes to the tireless brain and the skilful hand of this modest Leipsic professor. Ludwig combined, in an almost ideal manner and inseparably, great investigating power and great teaching power. An investigator himself, throughout the course of his busy life he trained between two and three hundred investigators, and more than any other man since Johannes Müller he has directed the course of physiological research. The numberless publications from his laboratory bear the names of his pupils and rarely his own, but the inscription, 'Aus dem physiologischen Institut zu Leipsic,' is the seal of their worth.

Ludwig was a man of the broadest sympathies and culture, restless and eager for knowledge within or without the boundaries of his own science. But he was content to study specific problems and to refrain from baseless and sweeping hypotheses. In the fifty-three years of his constant labor he left untouched few fields of the physiology of his time, and he never delved lightly or superficially. A record like his is rarely equalled. To the end he maintained his interest and activity fresh, and at the age of seventy-five he wrote to an American friend, "Ueberall liegt so viel brach, überall giebt es so viele Lücken, dass man bald mehr Aufgaben als Kräfte besitzt."

It was a memorable day for biology when Ludwig conceived the idea of the kymograph, the instrument used for recording physiological movements, for the invention of the kymograph marked the introduction of the graphic method into physiology. Ludwig once wrote, "Observation and experiment alone bring the light that illuminates the secret ways of nature." The graphic method has made observation and experi-

ment exact, and has revolutionized the biological sciences. Ludwig is responsible for much of the apparatus of precision now in use in physiological laboratories. To him must be ascribed also the fruitful method of separating single organs from the rest of an animal body, and maintaining them for study in a vital condition, a process indispensable to the understanding of function in a complicated organism.

Besides these additions to method, among the more noteworthy of his many contributions to physiology, either alone or in conjunction with his pupils, may be mentioned: numerous facts and principles regarding the dynamics of the circulation of the blood; the details of the heart's action; the location of the vaso-motor centre; the discovery of the depressor nerve; the mutual relations of respiration and circulation; the blood gases; many anatomical and physiological advances regarding the lymphatic system; the secretory function of the chorda tympani nerve; the mutual relations of gland secretion and blood circulation; gas exchange and production of heat in tissues; the presence of inosit, uric acid and other substances in the animal body; numerous facts regarding the metabolism of specific tissues; the course taken by the food-stuffs in absorption; the minute physiological anatomy of the kidney, the liver, the intestine, the pancreas, the salivary glands, the heart, the skin, etc.; many facts regarding general muscle and nerve physiology, the central nervous system and the special senses.

The leading events in Ludwig's life are as follows: Carl Friedrich Wilhelm Ludwig, the son of a Hessian army officer who served in the Napoleonic wars, born in Witzenhausen December 29th, 1816; studied in Erlangen and Marburg; M. D., Marburg, 1839; prosector in anatomy, Marburg, 1841; privat-docent in physiology, Marburg, 1842; extraordinary professor of comparative anatomy, Marburg, 1846; professor of anatomy

and physiology, Zürich, 1849; professor of physiology and zoölogy, Vienna, 1855; professor of physiology, Leipsic, 1865.

Probably few American physiologists received the news of Ludwig's death without a feeling of sadness far beyond that occasioned by the loss to science. Ludwig liked America and Americans, and many of his colleagues upon this side of the Atlantic have been his pupils and have found in him a warm personal friend. His wit, his sympathy, his breadth of mind, his love of books and of music, were conspicuous. To work with him was to receive the undying stimulus of a master mind and to feel the charm of a simple, sweet, winning personality.

FREDERIC S. LEE.

COLUMBIA COLLEGE.

CORRESPONDENCE.

THE FROG WAS NOT BRAINLESS BUT DECEREBRIZED.

IN the report of the meeting of the Association of American Anatomists last December in SCIENCE for March 15, 1895, p. 297, it is said that 'Dr. Wilder exhibited a Brainless Frog, etc.' The animal shown had been deprived of his cerebrum Dec. 7, 1894, for demonstration to my class in physiology of the points first, I believe, observed by Goltz. The brain was transected at the diencephal (thalami) and the entire cerebrum removed as described by me in 1886.* The frog was unusually large and vigorous, and was exhibited partly on that account, and partly because when it dies the condition of the brain will be determined and reported to the Association. At this writing, however, it is still living and has been

*Remarks upon a living frog which was decerebrized more than seven months ago. *Amer. Neurol. Assoc. Trans.*, 1886. *Jour. Nerv. and Mental Dis.*, XIII., p. 30. (Abstracts in *N. Y. Med. Record*, July 31, 1886, SCIENCE, Aug. 7, 1886, and *Medical News*, Aug. 7, 1886.)

photographed in various attitudes, amongst others while maintaining its balance on a cylinder by 'backing' instead of going forward as usual.

The object of the present note is to reprobate the use of *brainless* and *decerebrized* as interchangeable terms. The latter alone was used by me at the meeting, and was accessible in type-writing to all who were present. Nevertheless, both at that time and afterward, there appeared many newspaper paragraphs as to 'Dr. Wilder's brainless frog.' An attempt to correct the misapprehension through the Associated Press only made the matter worse, for I was promptly credited with 'another brainless frog.'

Perhaps, however, we ought not to condemn the popular confusion of terms too strongly in view of the following example among professional anatomists. At the Tenth International Medical Congress in Berlin, August 5, 1890, Professor Sir William Turner, F. R. S., etc., delivered an address, the official title of which, as printed in the *Journal of Anatomy and Physiology* for October, is 'The Convolutions of the Brain;' the real subject is The Fissures of the Cerebrum.

BURT G. WILDER.

ITHACA, N. Y., May 25, 1895.

TEXT-BOOK OF INVERTEBRATE MORPHOLOGY.

TO THE EDITOR OF SCIENCE: A reply to a book review is undoubtedly in many cases inadvisable, but there are certain statements in the review of my Text-book of Invertebrate Morphology in your issue of May 3d which seem, as a matter of justice, to call for some comment. A reviewer has a perfect right to express his opinion concerning the views set forth by an author, but the latter has a right to expect that his statements will not be misrepresented either directly or by implication, and I wish to call attention to certain misrepresentations